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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/781,341	02/12/2001	Shih-Yuan Wang	0980/62251-C	1971

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EXAMINER	
WANG, GEORGE Y	
ART UNIT	PAPER NUMBER
2871	

DATE MAILED: 08/10/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/781,341	WANG, SHIH-YUAN	
	Examiner	Art Unit	
	George Y. Wang	2871	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01 May 2003*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-40* is/are pending in the application.

4a) Of the above claim(s) *19-40* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12 February 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The corrected abstract filed on May 1, 2003 is deemed proper and accepted by Examiner.

Election/Restrictions

2. This application contains claims 19-40 drawn to an invention nonelected without traverse in Paper No. 9. A complete reply to the final rejection must include cancellation of nonelected claims or other appropriate action (37 CFR 1.144) See MPEP § 821.01.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Van Der Tol (U.S. Patent No. 5,418,867) in view of DiGiovanni et al. (U.S. Patent No. 5,802,236, from hereinafter "DiGiovanni").

5. As to claim 1, Van Der Tol discloses an optical device for coupling a first optical waveguide (fig. 2, ref. A) with a first cross-sectional material pattern to a second optical waveguide (fig. 2, ref. E) with a second cross-sectional material pattern different from that of the first using an optical coupling waveguide (fig. 2, ref. C) a first end that has a cross-sectional pattern that matches and connects to the first optical waveguide, a second end that has a cross-sectional pattern that matches and connects to the second optical waveguide, and a transitional regions between the first and second ends configured so that an optical signal entering the first end propagates adiabatically to the second end (abstract).

However, Van Der Tol does not specifically disclose waveguides with a fiber structure. Furthermore, the reference fails to specifically teach the avoidance of optical signal reflections back into the first optical fiber.

DiGiovanni discloses an optical device with a microstructure optical fiber having various cross-sectional void patterns (abstract).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have avoided optical signal reflections back into the first optical fiber since one would be motivated to maximize optical transmission. Van Der Tol suggests an optical device where low attenuation and low optical signal reflection is vital to wavelength-sensitive signal propagation (col. 2, lines 12-19).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a fiber structure for the waveguide coupling device since one would be motivated to have properties that are unattainable in conventional optical waveguides and fibers (col. 3, lines 1-3). Provided that the

fiber meets some simple conditions, an effective refractive index difference between core and cladding can be much larger than traditional doping means (col. 3, lines 4-11), making it highly useful in communication systems employing dispersion compensation, amplification, laser, saturation absorption, gratings, and non-linear elements (abstract).

6. Regarding claim 2-5, Van Der Tol disclose the optical device recited above with a transitional region having a cross-sectional pattern that changes gradually from the first end pattern to that of that of the second end pattern over an axial distance that is at least ten thousand times longer (fig. 4a; col. 9, lines 11-22) than a wavelength of the optical signal.

However, the reference fails to disclose void and solid patterns characterized by size, center-to-center spacings, and by the number of voids and where the transition sequence of void patterns changes gradually from the first end pattern to that of that of the second end pattern over an axial distance that is at least ten thousand times longer than a wavelength of the optical signal.

DiGiovanni discloses an optical device with void (col. 7, lines 5-23) and solid (col. 7, lines 24-25) patterns in the optical fibers characterized by size, center-to-center spacings, and by the number of voids (abstract; col. 7, lines 8-16).

It would have been obvious to one or ordinary skill in the art at the time the invention was made to include void and solid patterns in the optical fibers and to characterize them by size, center-to-center spacings, and by the number of voids

into the transitional region so that the void sequence changes gradually from the first end pattern to that of that of the second end pattern over an axial distance that is at least ten thousand times longer than a wavelength of the optical signal since one would be motivated by the fact that a microstructured optical fiber (abstract), with void (col. 7, lines 5-23) and solid (col. 7, lines 24-25) patterns, has properties that are unattainable in conventional optical waveguides and fibers (col. 3, lines 1-3). Provided that the fiber meets some simple conditions, an effective refractive index difference between core and cladding can be much larger than traditional doping means (col. 3, lines 4-11), making it highly useful in communication systems employing dispersion compensation, amplification, laser, saturation absorption, gratings, and non-linear elements (abstract).

7. As per claim 6, Van Der Tol teaches a transition region having a core that tapers gradually from the first end pattern to that of that of the second end (col. 2, lines 49-52).

8. Regarding claim 7, Ven Der Tol and DiGiovanni disclose the apparatus as recited above. However, the references fail to specifically teach void sizes of the transition sequence decreasing gradually to zero at the second end.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have void sizes of the transition sequence decreasing gradually to zero at the second end since one would be motivated to provide solid patterning at the second end (col. 7, lines 24-25). Thus, in order to do so,

one of ordinary skill in the art would recognize that a gradual decrease in void size would allow for the fiber to change to solid patterning that has advantageous uses in dispersion compensation, amplification, laser, saturation absorption, gratings, and non-linear elements (abstract).

9. As to claim 8, Van Der Tol discloses the optical device recited above. However, the reference fails to disclose a transition region core having a material refractive index profile selected so that the effective refractive index profile varies linearly over the axial distance from the first end to the second end.

DiGiovanni discloses an optical device with core having a variable refractive index profile over the axial distance of the core (col. 4, lines 26-32).

It would have been obvious to one or ordinary skill in the art at the time the invention was made to have a transition region core having a material refractive index profile selected so that the effective refractive index profile varies linearly over the axial distance from the first end to the second end since one would be motivated to vary the features of the fiber so that the fiber supports the desired guided mode or modes (col. 4, lines 26-32). Moreover, such flexibility permits a wide range of uses that include dispersion compensation, amplification, laser systems, saturation absorption, gratings, and non-linear elements (abstract).

10. As to claim 9, Van Der Tol discloses an optical device for coupling a first optical waveguide (fig. 2, ref. A) with a first cross-sectional material pattern to a second optical waveguide (fig. 2, ref. E) with a second cross-sectional material

pattern different from that of the first using an optical coupling waveguide (fig. 2, ref. C) a first end that has a cross-sectional pattern that matches and connects to the first optical waveguide, a second end that has a cross-sectional pattern that matches and connects to the second optical waveguide, and a transitional regions between the first and second ends configured so that an optical signal entering the first end propagates adiabatically to the second end (abstract).

However, Van Der Tol does not specifically disclose waveguides with a microstructured optical fiber structure. Although the reference teaches the matching of solid cross-sectional patterns, Van Der Tol does not specifically teach the matching of void patterns and refractive index profiles.

DiGiovanni discloses an optical device with a microstructure optical fiber having various cross-sectional void patterns and refractive index profiles (abstract).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a microstructured optical fiber structure having various cross-sectional void patterns and refractive index profiles in the waveguide coupling device since one would be motivated to have properties that are unattainable in conventional optical waveguides and fibers (col. 3, lines 1-3). Provided that the fiber meets some simple conditions, an effective refractive index difference between core and cladding can be much larger than traditional doping means (col. 3, lines 4-11), making it highly useful in communication systems employing dispersion compensation, amplification, laser, saturation absorption, gratings, and non-linear elements (abstract).

11. <u>As per claim 10</u>, Van Der Tol disclose the optical device recited above with a transitional region having a cross-sectional pattern that changes gradually from the first end pattern to that of that of the second end pattern over an axial distance that is at least ten thousand times longer (fig. 4a; col. 9, lines 11-22) than a wavelength of the optical signal.

12. <u>Regarding claims 11-15 and 17-18</u>, Ven Der Tol and DiGiovanni disclose the apparatus as recited above. However, the references fail to specifically teach void sizes of the transition sequence core and cladding that decrease and increase, respectively, gradually to the size at the second end. Furthermore, the reference fails to specifically teach void and solid patterns characterized by size, center-to-center spacings, and by the number of voids and where the transition sequence of void patterns changes gradually from the first end pattern to that of that of the second end pattern over an axial distance of the fiber.

DiGiovanni discloses an optical device with void (col. 7, lines 5-23) and solid (col. 7, lines 24-25) patterns in the optical fibers characterized by size, center-to-center spacings, and by the number of voids (abstract; col. 7, lines 8-16).

It would have been obvious to one or ordinary skill in the art at the time the invention was made to include void and solid patterns in the optical fibers and to characterize them by size, center-to-center spacings, and by the number of voids into the transitional region so that the void sequence changes gradually from the

first end pattern to that of that of the second end pattern over an axial distance that is at least ten thousand times longer than a wavelength of the optical signal since one would be motivated by the fact that a microstructured optical fiber (abstract), with void (col. 7, lines 5-23) and solid (col. 7, lines 24-25) patterns, has properties that are unattainable in conventional optical waveguides and fibers (col. 3, lines 1-3). Provided that the fiber meets some simple conditions, an effective refractive index difference between core and cladding can be much larger than traditional doping means (col. 3, lines 4-11), making it highly useful in communication systems employing dispersion compensation, amplification, laser, saturation absorption, gratings, and non-linear elements (abstract).

It would have also been obvious to one of ordinary skill in the art at the time the invention was made to have void sizes of the transition sequence core increase and the clad decrease gradually to the size at the second end since one would be motivated to provide solid patterning at the second end (col. 7, lines 24-25). Thus, in order to do so, one of ordinary skill in the art would recognize that a gradual decrease in void size would allow for the fiber to change to solid patterning that has advantageous uses in dispersion compensation, amplification, laser, saturation absorption, gratings, and non-linear elements (abstract).

13. As to claim 16, Van Der Tol discloses the optical device recited above. However, the reference fails to disclose a transition region core having a material

refractive index profile selected so that the effective refractive index profile varies linearly over the axial distance from the first end to the second end.

DiGiovanni discloses an optical device with core having a variable refractive index profile over the axial distance of the core (col. 4, lines 26-32).

It would have been obvious to one or ordinary skill in the art at the time the invention was made to have a transition region core having a material refractive index profile selected so that the effective refractive index profile varies linearly over the axial distance from the first end to the second end since one would be motivated to vary the features of the fiber so that the fiber supports the desired guided mode or modes (col. 4, lines 26-32). Moreover, such flexibility permits a wide range of uses that include dispersion compensation, amplification, laser systems, saturation absorption, gratings, and non-linear elements (abstract).

Response to Arguments

14. Applicant's arguments filed May 1, 2003 have been fully considered but they are not persuasive.

Applicant's main argument is that the primary DiGiovanni reference is devoid of any motivation for developing an optical device according to Claim 1. Examiner disagrees. First, Van der Tol is the primary reference and DiGiovanni is the secondary reference. Second, the motivation to combine is clear in both prior art references. Van Der Tol suggests an optical device where low attenuation and low optical signal reflection is vital to wavelength-sensitive signal propagation (col. 2, lines 12-19). DiGiovanni offers the motivation to combine

since one would be motivated to have properties that are unattainable in conventional optical waveguides and fibers (col. 3, lines 1-3). Provided that the fiber meets some simple conditions, an effective refractive index difference between core and cladding can be much larger than traditional doping means (col. 3, lines 4-11), making it highly useful in communication systems employing dispersion compensation, amplification, laser, saturation absorption, gratings, and non-linear elements (abstract).

As such, Examiner holds to the validity of the references used and maintains rejection.

Conclusion

15. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to George Y. Wang whose telephone number is 571-272-2304. The examiner can normally be reached on M-F, 8 am - 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert H. Kim can be reached on 571-272-2293. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

gw
August 9, 2004

TARIFUR R. CHOWDHURY
PRIMARY EXAMINER